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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,121	01/27/2004	Chengjun Liu	436/5	2115

27538 7590 05/17/2006

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EXAMINER	
CHEN, WENPENG	
ART UNIT	**PAPER NUMBER**
2624	

DATE MAILED: 05/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/766,121	LIU, CHENGJUN	
	Examiner	Art Unit	
	Wenpeng Chen	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5,7,10-16 and 28-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-5, 7, 10-16, and 28-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Examiner's responses to Applicant's remark

1. Applicant's arguments with regard to the art rejections, filed on 2/28/2006, have been fully considered, but not persuasive.

a. With regard to Claims 10-12 and 13-16, the Applicant's arguments are moot due to the newly added amendments.

b. Applicant's argument -- With regard to Claims 1 and 3-7, the Applicant alleged that the combination of Yang and Go does not teach the feature related to "combining the image, the 1-D Haar representation, and the amplitude projections".

Examiner's response -- The Examiner has provided detailed discussion of obvious modifications to Yang's teachings with sound motivations in view of knowledge common known to one of ordinary skill in the art, at the time of the invention and Go's teaching. More specifically, Yang teaches a step of using an image, edge representation, and amplitude projections as features for face recognition. Go teaches using 1-D Haar wavelet to derive edge images in both vertical and horizontal directions. So all the image, the 1-D Haar representation, and the amplitude projections are taught by the combination of Yang and Go. The Examiner also provided the motivation for combining all features for recognition in the previous office action: "It is desirable to improve accuracy of facial recognition. This objective can be achieved by combining various features as discriminating components." The Applicant did not provide any rebuttal to this Examiner's position: the combination is obvious to one of ordinary skill in the art, at the time of the invention.

Claim Objections

2. Claims 28-29, 32-33, and 36-37 are objected to because of the following informalities.

-- "Harr" shall be changed to "Haar" as used in Claim 1.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-5, 7, 10-12, and 28-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. ("Detecting Faces in Images: a Survey," Yang, Ming-Hsuan et al., IEEE Trans. On Pattern Analysis and Machine Intelligence, v. 24, no. 1, January 2002, pages 34-58) in view of Go (US patent 5,761,341 cited previously.)

a. For Claims 1 and 3-5, 7, and 28-31

Yang teaches a method of representing an input image comprising:

-- obtaining an image; (right column, page 43, section 2.4.2; last paragraph, right column, page 45)

-- calculating its edge representation and amplitude projections; (last paragraph, right column, page 45; left column, page 37 and Fig. 3)

-- using the image, edge representation, and amplitude projections as features for face recognition; (first paragraph, section 2.2.4 "Multiple features; left column, page 43)

-- combining several features for facial recognition. (first paragraph, section 2.2.4 "Multiple features; right column, page 45)

However, Yang does not explicitly teach combining all the image, edge representation, and amplitude projections as features for face recognition.

It is desirable to improve accuracy of facial recognition. This objective can be achieved by combining various features as discriminating components. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to combine all the image, edge representation, and amplitude projections that appear in different portions of Yang's paper as features for face recognition because this combination improves accuracy of facial recognition.

Furthermore, however such an obvious extension of Yang's teaching does not teach using 1-D Haar wavelet representation of the image as features for facial recognition.

Go teaches using 1-D Haar wavelet to derive edge images in both vertical and horizontal directions, wherein said 1-D Haar representation comprises a horizontal and vertical difference images defined by the equations given in claims 28 and 29 of the present application, respectively. (column 7, lines 1-50; Please note that Go's equation in line 5, column 7 is the same as equation (1) of '596 application. The images generated by Go thus are 1-D Haar wavelet representations of the image in the vertical and horizontal directions. The horizontal equation is given in column 7, line 5. The vertical equation is given in column 7, lines 37-39.)

It is desirable to be flexible in processing image for facial recognition. Because 1-D Haar wavelet operation is one of edge determining processes, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to include 1-D Haar wavelet operation to

generate Yang's edge maps as part of feature vector because this combination provides process flexibility.

The combination thus teaches:

-- calculating 1-D Haar wavelet representation and amplitude projections of an image;

-- combining said input image with said I-D Haar representation and said amplitude projections.

Yang further teaches in the method the following features:

-- wherein said combining includes forming a discriminating feature analysis (DFA) vector of said image; (right column, page 43; The feature vector is normalized and presented with respect to the mean image. The vector is thus a DFA vector.)

-- wherein a plurality of DFA vectors are formed based upon training images; (section 2.4.2; the learning process being inherently based on training images)

-- wherein said DFA vectors from said training images are used to model face and non face classes using a single multivariate probability distribution function (PDF) for each of said face classes; (left column, page 43 teaching two types of image, a face and a nonface; section 2.4.2 from right column, page 43 to left column, page 44 teaching the Gaussian PDF)

-- wherein said models are stored and used for later analysis of input images; (right column, page 43; Comparison is made between an input image and the prototype clusters.. The prototype clusters are the models.)

-- calculating a DFA of an input image to be analyzed; (right column, page 43; Comparison is made between an input image and the prototype clusters. The DFA of the input image has to be calculated before the comparison.)

-- using said DFA vectors of said input image to classify the image using a Bayesian classifier; (section 2.4, left column, page 43)

-- wherein said amplitude projections comprise horizontal projections defined by the equation as defined in the pending claims; (last paragraph, left column, page 37)

-- wherein said amplitude projections comprise vertical projections defined by the equation as defined in the pending claims. (last paragraph, left column, page 37)

b. For Claims 10-12 and 32-35

Yang teaches a method of classifying an input images as being of a first type or of a second type, the method comprising:

-- calculating Gaussian PDFs (Probability Density Functions) of images classes of said first type and of said second type using a single multivariate Gaussian PDF,

- wherein said first type is a face and said second type is a nonface; (left column, page 43 teaching two types of image, a face and a nonface; section 2.4.2 from right column, page 43 to left column, page 44 teaching the Gaussian PDF)

-- utilizing said Gaussian PDFs in conjunction with at least one input image to classify said input image as either being of a first type or of a second type; (section 2.4.2 from right column, page 43 to left column, page 44)

-- wherein the PDFs of the face and nonface classes are calculated only after first calculating a DFA (Discriminating Feature Analysis) vector of each of a plurality of training images; (DFA being generated at first in section 2.4.2 of right column, page 43, then PDF's being calculated in left column, page 44)

-- wherein a DFA vector of an input image is calculated and a Bayesian discriminator function is used to process the DFA vector of the input image to classify said input image as either a face or nonface; (section 2.4, left column, page 43)

-- wherein said PDFs of the face and nonface classes are calculated during training based upon a sample set of at least several hundred FERET images; (section 3.1, page 49)

-- obtaining an image; (right column, page 43, section 2.4.2; last paragraph, right column, page 45)

-- calculating its edge representation and amplitude projections; (last paragraph, right column, page 45; left column, page 37 and Fig. 3)

-- using the image, edge representation, and amplitude projections as features for face recognition; (first paragraph, section 2.2.4 "Multiple features; left column, page 43)

-- combining several features for facial recognition. (first paragraph, section 2.2.4 "Multiple features; right column, page 45)

However, Yang does not explicitly teach the feature of "wherein said DFA vectors are derived by combining said training images, respective 1-D Haar representations of said training images, and respective amplitude projections of said training images.

It is desirable to improve accuracy of facial recognition. This objective can be achieved by combining various features as discriminating components. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to combine all the image, edge representation, and amplitude projections that appear in different portions of Yang's paper as features for face recognition because this combination improves accuracy of facial recognition.

Furthermore, however such an obvious extension of Yang's teaching does not teach using 1-D Haar wavelet representation of the image as features for facial recognition.

Go teaches using 1-D Haar wavelet to derive edge images in both vertical and horizontal directions, wherein said 1-D Haar representation comprises a horizontal and vertical difference images defined by the equations given in claims 28 and 29 of the present application, respectively. (column 7, lines 1-50; Please note that Go's equation in line 5, column 7 is the same as equation (1) of '596 application. The images generated by Go thus are 1-D Haar wavelet

representations of the image in the vertical and horizontal directions. The horizontal equation is given in column 7, line 5. The vertical equation is given in column 7, lines 37-39.)

It is desirable to be flexible in processing image for facial recognition. Because 1-D Haar wavelet operation is one of edge determining processes, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to include 1-D Haar wavelet operation to generate Yang's edge maps as part of feature vector because this combination provides process flexibility.

Yang further teaches in the method the following features:

-- wherein said amplitude projections comprise horizontal projections defined by the equation as defined in the pending claims; (last paragraph, left column, page 37)

-- wherein said amplitude projections comprise vertical projections defined by the equation as defined in the pending claims. (last paragraph, left column, page 37)

5. Claims 13-16 and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sung et al. ("Example-Based Learning For View-Based Human Face Detection," Sung, et al., IEEE Trans. Pattern Analysis and Machine Intelligence, Vol. 20, No. 1, January 1998, pp. 39-51 cited in IDS filed on 4/7/2005) in view of Yang et al. ("Detecting Faces in Images: a Survey," Yang, Ming-Hsuan et al., IEEE Trans. On Pattern Analysis and Machine Intelligence, v. 24, no. 1, January 2002, pages 34-58) and Go (US patent 5,761,341.)

Sung teaches a method, comprising:

-- modeling a face class of images, wherein images outside said face class of images are nonfaces within a nonface class; (sections 2, 3.1, 3.3, and 3.4, specifically section 3.4; Fig. 4; Fig. 4 clearly shows that nonfaces are outside face classes.)

-- modeling a subset of said nonfaces which lie closest to said face class, wherein said nonfaces in said subset are support nonfaces; (sections 2, 3.1, 3.3, and 3.4, specifically section 3.4; Fig. 4; The nonface patterns that are wrongly classified as faces are the nonfaces which lie closest to said face class. It obvious that the "false positive" patterns are those closest to the faces patterns. They are support nonfaces.)

-- wherein said support nonfaces are closest, among said nonfaces in said nonface class, to a decision surface between said face class and said nonface class; (sections 2, 3.1, 3.3, and 3.4, specifically section 3.4; Fig. 4; The 12 pairs of distances associated with face and nonface clusters are used to classify face window patterns form nonface window patterns. The relation defined by the distances defines a surface in the multiple dimensional feature space.)

-- wherein said modeling said support nonfaces comprises: modeling support nonfaces as a multivariate normal distribution; (sections 2, 3.1, 3.3, and 3.4, specifically section 3.4; Each nonface cluster is represented by a multivariate normal distribution. A Gaussian distribution is a normal distribution.)

-- estimating a conditional density function of said nonface class using a plurality of principal components, an input image, a mean nonface value, and eigenvalues of said nonface class. (sections 2, 3.1, 3.3, and 3.4, specifically section 3.4; The density estimation is done with regard to PCA, the input of the nonface images, the mean image and a covariance, and eigenvalues of the nonface class. The 75 eigenvectors are selected as the eigenvectors having the largest 75 eigenvalues. This is the method perform in a PCA (Principal component analysis).)

However, Sung does not teach the feature of "wherein (1) a 1-D Haar representation, (2) an input image, and (3) amplitude projections are calculated for the images and utilized in said modeling."

Yang teaches a method of representing an image comprising:

-- calculating its edge representation and amplitude projections; (last paragraph, right column, page 45; left column, page 37 and Fig. 3)

-- using the image, edge representation, and amplitude projections as features for face recognition; (first paragraph, section 2.2.4 "Multiple features; left column, page 43)

-- combining several features for facial recognition. (first paragraph, section 2.2.4 "Multiple features; right column, page 45)

It is desirable to improve accuracy of facial recognition. This objective can be achieved by combining various features as discriminating components. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to use at least both the image and amplitude projections taught by Yang for modeling a subset of Sung's faces and nonfaces because this combination improves accuracy of facial recognition by better distinguishing faces from nonfaces.

However the combination of Sung and Yang does not teach using 1-D Haar wavelet representation of the image as features for facial recognition.

Go teaches using 1-D Haar wavelet to derive edge images in both vertical and horizontal directions, wherein said 1-D Haar representation comprises a horizontal and vertical difference images defined by the equations given in claims 28 and 29 of the present application, respectively. (column 7, lines 1-50; Please note that Go's equation in line 5, column 7 is the same as equation (1) of '596 application. The images generated by Go thus are 1-D Haar wavelet representations of the image in the vertical and horizontal directions. The horizontal equation is given in column 7, line 5. The vertical equation is given in column 7, lines 37-39.)

It is desirable to be flexible in processing image for facial recognition. Because 1-D Haar wavelet operation is one of edge determining processes, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to include 1-D Haar wavelet operation to generate Yang's edge maps as part of feature vector because the overall combination provides process flexibility.

The overall combination thus teaches:

-- the feature of "wherein (1) a 1-D Haar representation, (2) an input image, and (3) amplitude projections are calculated for the images and utilized in said modeling."

Yang further teaches in the method the following features:

-- wherein said amplitude projections comprise horizontal projections defined by the equation as defined in the pending claims; (last paragraph, left column, page 37)

-- wherein said amplitude projections comprise vertical projections defined by the equation as defined in the pending claims. (last paragraph, left column, page 37)

Conclusion

6. THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). The Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR

1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wenpeng Chen whose telephone number is 571-272-7431. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on 571-272-7778. The fax phone numbers for the organization where this application or proceeding is assigned are 571-273-8300 for regular communications and 571-273-8300 for After Final communications. TC 2600's customer service number is 571-272-2600.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

May 12, 2006

WENPENG CHEN
PRIMARY EXAMINER